

What is claimed is:

1 1. An organometallic compound having bonds between metal atoms  
2 and nitrogen atoms or bonds between semimetal atoms and nitrogen  
3 atoms, wherein, the chlorine content of 200 ppm or less and the  
4 water content of 30 ppm or less.

1 2. An organometallic compound according to claim 1, wherein the  
2 general formula of the compound is represented by the following  
3 formula (1):



5 (wherein, M represents a metal atom or semimetal atom, with  
6 the metal atom being Hf, Zr, Ta, Ti, Ce, Al, V, La, Nb or Ni,  
7 and the semimetal atom being Si,  $R^1$  represents a methyl group or  
8 ethyl group,  $R^2$  represents an ethyl group, n represents the  
9 valence of M, and s represents an integer of 0 to n-1).

1 3. An organometallic compound according to claim 2, wherein when  
2 M is Hf in formula (1), the chlorine content in the compound is  
3 200 ppm or less and the water in the compound content is 30 ppm  
4 or less.

1 4. An organometallic compound according to claim 2, wherein when  
2 M is Si in formula (1), the chlorine content in the compound is  
3 1 ppm or less and the water content in the compound is 30 ppm

4 or less.

1 5. A synthesis method of an organometallic compound comprising:  
2 obtaining a crude product of an organometallic compound by  
3 using a metal-containing compound and aminolithium;  
4 distilling said crude product under reduced pressure in a  
5 vacuum distillation step to obtain a purified product of said  
6 organometallic compound; and,  
7 removing impurities contained in the purified product in an  
8 impurity removal step using flash chromatography following said  
9 vacuum distillation step.

1 6. A synthesis method according to claim 5, wherein said  
2 impurity removal step comprises:  
3 forming a filler layer inside a pressure-resistant column  
4 by filling into said column a slurry prepared by adding a filler  
5 to a developing solvent;  
6 injecting said purified product into a top of the filler  
7 layer; and,  
8 passing said purified product through the filler layer by  
9 supplying a pressurized gas at a predetermined flow rate into  
10 the column from a top of the column to adsorb impurities contained  
11 in said purified product in the filler layer.

1 7. A synthesis method according to claim 5, wherein said

2 impurities removed from the purified product are chlorine and  
3 water.

1 8. A synthesis method according to claim 6, wherein said  
2 impurities removed from the purified product are chlorine and  
3 water.

1 9. A synthesis method according to claim 6, wherein said  
2 developing solvent is at least one organic solvent selected from  
3 the group consisting of n-alkane, diethyl ether and  
4 dichloromethane, and a water content in the organic solvent is  
5 30 ppm or less.

1 10. A synthesis method according to claim 6, wherein said filler  
2 in the column comprises at least one type of particle selected  
3 from the group consisting of  $\text{SiO}_2$  particles,  $\text{Al}_2\text{O}_3$  particles,  $\text{ZrO}_2$   
4 particles,  $\text{TiO}_2$  particles and  $\text{HfO}_2$  particles having a mean  
5 particle diameter of 0.3-0.5  $\mu\text{m}$ , and a particle size distribution  
6 width  $d_{90}/d_{10}$  of 0.8-1.2.

1 11. A synthesis method according to claim 6, wherein said  
2 pressure-resistant column is a glass column having a diameter  
3 of 10-20 cm and a height of 30-50 cm.

1 12. A synthesis method according to claim 10, wherein said

2 pressure-resistant glass column is filled with 500-1000 g of  
3 column filler.

1 13. A synthesis method according to claim 11, wherein said  
2 pressure-resistant glass column is filled with 500-1000 g of  
3 column filler.

1 14. A synthesis method according to claim 6, wherein the  
2 pressurized gas is Ar gas, a pressure of the pressurized gas is  
3 1-2 kg, and a column flow rate has a spatial velocity (SV value)  
4 of 2-4 cm/min.

1 15. A synthesis method according to claim 5, wherein said  
2 metal-containing compound is hafnium chloride, zirconium  
3 chloride, tantalum chloride, titanium chloride, cerium chloride,  
4 vanadium chloride, lanthanum chloride, niobium chloride, nickel  
5 chloride or silane tetrachloride.

1 16. A synthesis method according to claim 5, wherein said  
2 aminolithium is obtained by reacting one of dimethylamine and  
3 diethylamine with n-butyllithium.

1 17. A synthesis method according to claim 5, wherein when said  
2 metal-containing compound is hafnium chloride, the resulting  
3 organometallic compound is one of tetraquis

4 (dimethylamino)hafnium and tetraquis(diethylamino)hafnium.

1 18. A synthesis method according to claim 15, wherein when said  
2 metal-containing compound is hafnium chloride, the resulting  
3 organometallic compound is one of tetraquis  
4 (dimethylamino)hafnium and tetraquis(diethylamino)hafnium.

1 19. A synthesis method according to claim 5, wherein when the  
2 metal-containing compound is silane tetrachloride, the resulting  
3 organometallic compound is one of tetraquis  
4 (dimethylamino)silane and tetraquis(diethylamino)silane.

1 20. A synthesis method according to claim 15, wherein when the  
2 metal-containing compound is silane tetrachloride, the resulting  
3 organometallic compound is one of tetraquis  
4 (dimethylamino)silane and tetraquis(diethylamino)silane.

1 21. A solution raw material containing an organometallic  
2 compound according to claim 1 dissolved in an organic solvent.

1 22. A solution raw material containing an organometallic  
2 compound according to claim 2 dissolved in an organic solvent.

1 23. A solution raw material containing an organometallic  
2 compound according to claim 3 dissolved in an organic solvent.

1 24. A solution raw material comprising an organometallic  
2 compound according to claim 4 dissolved in an organic solvent.

1 25. A solution raw material comprising an organometallic  
2 compound obtained by a synthesis method according to claim 5  
3 dissolved in an organic solvent.

1 26. A solution raw material comprising an organometallic  
2 compound obtained by a synthesis method according to claim 6  
3 dissolved in an organic solvent.

1 27. A solution raw material according to claim 21, wherein said  
2 organic solvent is at least one type of compound selected from  
3 the group consisting of n-alkane, tetrahydrofuran, cyclohexane,  
4 cycloalkane and branched alkane.

1 28. A solution raw material according to claim 22, wherein said  
2 organic solvent is at least one type of compound selected from  
3 the group consisting of n-alkane, tetrahydrofuran, cyclohexane,  
4 cycloalkane and branched alkane.

1 29. A solution raw material according to claim 23, wherein said  
2 organic solvent is at least one type of compound selected from  
3 the group consisting of n-alkane, tetrahydrofuran, cyclohexane,  
4 cycloalkane and branched alkane.

1 30. A solution raw material according to claim 24, wherein said  
2 organic solvent is at least one type of compound selected from  
3 the group consisting of n-alkane, tetrahydrofuran, cyclohexane,  
4 cycloalkane and branched alkane.

1 31. A solution raw material according to claim 25, wherein said  
2 organic solvent is at least one type of compound selected from  
3 the group consisting of n-alkane, tetrahydrofuran, cyclohexane,  
4 cycloalkane and branched alkane.

1 32. A solution raw material according to claim 26, wherein said  
2 organic solvent is at least one type of compound selected from  
3 the group consisting of n-alkane, tetrahydrofuran, cyclohexane,  
4 cycloalkane and branched alkane.

1 33. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using an organometallic compound  
3 according to claim 1.

1 34. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using an organometallic compound  
3 according to claim 2.

1 35. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using an organometallic compound

3 according to claim 3.

1 36. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using an organometallic compound  
3 obtained by a synthesis method according to claim 5.

1 37. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using an organometallic compound  
3 obtained by a synthesis method according to claim 6

1 38. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using a solution raw material according  
3 to claim 21.

1 39. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using a solution raw material according  
3 to claim 22.

1 40. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using a solution raw material according  
3 to claim 23.

1 41. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using a solution raw material according  
3 to claim 24.



1 42. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using a solution raw material according  
3 to claim 25.

1 43. A metal-containing thin film produced by metal organic  
2 chemical vapor deposition using a solution raw material according  
3 to claim 26.